REPORT ON GEOCHEMICAL SOIL SAMPLING OF THE WHIPSAW MINERAL CLAIMS (1881-1888).

Whipsaw Gulch, Island Mtn.
Cariboo Mining Division, British Columbia
N.T.S. Map Area 93H/4E
Latitude 53° 08'   Longitude 121° 38'

for

K.V. Campbell
Wells, B.C.

by

K.V. Campbell, Ph.D.

August 1982

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 19620

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1 INTRODUCTION

This report presents the results of geochemical soil sampling on the Whipsaw claims, located in the Cariboo Mining Division of central B.C. The Whipsaw property consists of eight mineral claims owned by K. Vincent Campbell of Wells, B.C. and staked in 1980.

The geological setting is such that there is a potential for two types of mineral deposits; gold and silver-bearing quartz veins and auriferous pyritic replacement bodies in limestone, as occur at the currently active Mosquito Creek Gold Mine some 2½ km to the southeast along the regional strike. At that mine site the ore-bearing horizon occurs near a particular rock unit contact which passes through the Whipsaw property. A VLF-EM survey performed in 1981 resulted in an interpretation of the location of this geological contact.

The geological soil sampling program of 1981 and 1982 had the objectives of (1) verifying the location of the inferred geological contact, and (2) testing for the presence of geochemical anomalies in soils over the rock unit contact area, the latter being the most favorable for mineralization.

The geochemical soil sampling was done in September 1981 and June 1982. Ten man-days were spent on the collection of 223 samples. One man-day was spent on cutting 3/4 km of trail along the location line. In addition, 4½ km of VLF-EM survey were completed in September, 1981. The geophysical results were included in the 1981 assessment report and the costs of this geophysical work, done after the 1981 anniversary of the recording date, are claimed as part of the current assessment report.

1.1 Location and Access

The Whipsaw claims, Whipsaw 1 to 8 inclusive, are located in National Topographic System map area 93H/4E and are 5 km northwest of the village of Wells, B.C., west of Barkerville (Figure 1), and 80 km east of Quesnel on Highway 26. The claims lie on the north side of Island Mtn., south of the Willow River.

Access to the property is by 4 wheel drive along Hardscrabble Road from Wells (Figure 3) and then by foot across the Willow River and walking about ½ km upslope to the location line.

1.2 Ownership and Claims Status

The property consists of eight 2-post mineral claims in the Cariboo Mining Division. Figure 2 is a copy of the mineral titles map M 93H/4E showing the Whipsaw claims. The claim information is as follows.

Claim Name	Record No.	Recording Date	Recorded Holder
Whipsaw 1	1881	August 25,1982	K.V. Campbell
Whipsaw 2	1882	"	"
Whipsaw 3	1883	"	"
Whipsaw 4	1884	"	"
Whipsaw 5	1885	"	"
Whipsaw 6	1886	"	"
Whipsaw 7	1887	"	"
Whipsaw 8	1888	"	"

1.3 References

The following is a chronological listing of public reports relevant to the Whipsaw property.

- Bowman, A., 1888, Report on the Geology of the Mining District of Cariboo, B.C., Geological Survey of Canada, Annual Report 1887-88, Volume 3, Part 1.

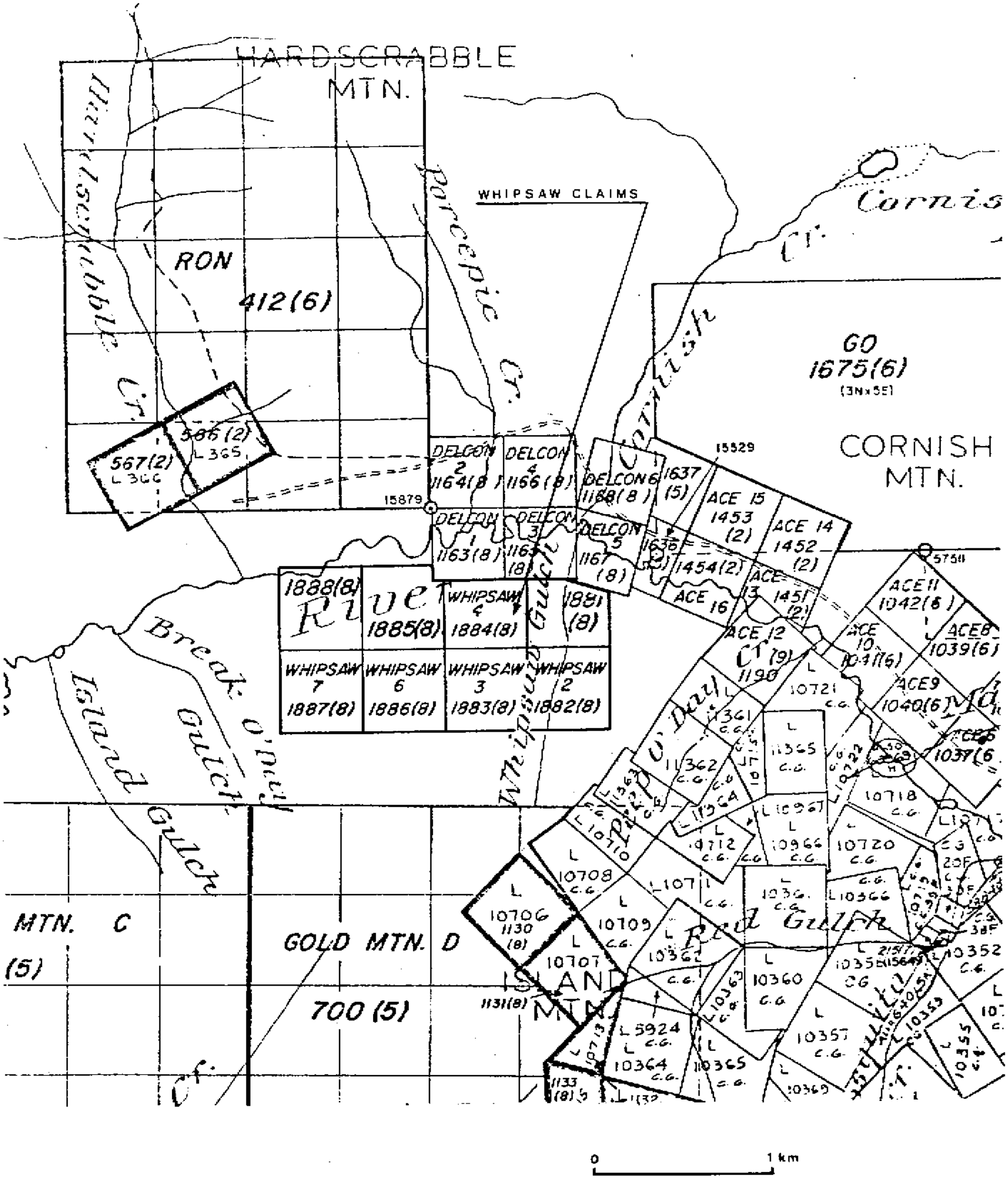
- Uglow, W.L., 1922, Bedrocks and Quartz Veins of Barkerville Map-Area, Cariboo District, B.C., Geological Survey of Canada, Summary Report 1922, Part A.

Location of Whipsaw Claims

0 150 km

Figure 1 | Sept. 4/81

K.V. Campbell



Claim Plan M93H/4E

Scale 1:31,620

Figure 2 Sept.4/81

K.V. Campbell

- Johnston, W.A. and Uglow, W.L., 1932, Placer and Vein Gold Deposits of Barkerville, Cariboo District, B.C., Geological Survey of Canada, Summary Report 1932, Part A1.
- Hanson, G., 1935, Barkerville Gold Belt, Cariboo District, B.C., Geological Survey of Canada, Memoir 181.
- Benedict, P.C., 1945, Structure at Island Mountain Mine, Wells, B.C., Canadian Institute of Mining and Metallurgy, Transactions, Volume XLVIII, pages 755-777.
- Sutherland Brown, A., 1957, Geology of the Antler Creek Area, Cariboo District, B.C., B.C. Department of Mines Bulletin No. 38.
- Campbell, R.B., Mountjoy, E.W., and Young, F.G., 1972, Geology of the McBride Map-Area, B.C., Geological Survey of Canada, Paper 72-35.
- Struik, L.C., 1979, Stratigraphy and Structure of the Barkerville-Cariboo River Area, Central B.C., Geological Survey of Canada, Paper 79-1B, pages 33-38.
- Struik, L.C., 1981a, Snowshoe Formation, Central B.C., Geological Survey of Canada, Paper 81-1A, pages 213-216.
- Struik, L.C., 1981b, A Re-examination of the Type Area of the Devono-Mississippian Cariboo Orogeny, Central British Columbia, Canadian Journal of Earth Sciences, Volume 18, pages 1767-1775.
- Struik, L.C., 1981c, Bedrock Geology Cariboo Lake, Spectacle Lakes, Swift River and Wells map areas, Cariboo District, B.C., Geological Survey of Canada, Open File Report 858.
- Campbell, K.V., and Campbell, C.J., 1981, Report on Geology and Geophysics of the Whipsaw Claims (1881-88), B.C. Ministry of Mines and Petroleum Resources Assessment Report, 14 pages.

1.4 History

1.4.1 Regional

The Cariboo area is the oldest mining camp in British Columbia, the first prospectors arriving c.1858. The early miners focused on placer deposits but by the 1880's gold-quartz veins were being mined. Historical lode gold mines located 3 to 10 km to the southeast of Whipsaw Gulch are the Island Mtn., Cariboo Gold Quartz, Canusa and Williams Creek Gold Mines. Gold was won from both gold-quartz veins and pyritic replacement bodies in limestone. Free gold-bearing quartz veins also occur at the Hardscrabble tungsten mine site ½ km to the northwest of Whipsaw Gulch, but these were never mined. The only gold mine producing at the present time in the area is the Mosquito Creek Gold Mine on Mosquito Creek, 2½ km to the southeast of Whipsaw Gulch. All of the foregoing gold mines and the axis of the main placer deposits lie along what is called the Barkerville Gold Belt. The Whipsaw property is at the northwest end of the known extension of this belt.

1.4.2 Property

The Whipsaw claims were staked in mid-August of 1980 because the area straddles the projection of the geology and structure at the Mosquito Creek Gold Mine to the southeast.

No record of earlier mineral claims was found. A hydraulic ditch, now mostly obliterated, crosses the claims in the vicinity of the location line. Presumably it served placer mining activities on Mosquito Creek, c.1930's. This ditch could be upgraded to an access road fairly easily. A cabin site and piles of boulders along the drainageways at the north edge of the claims attest to placer mining there. There are no known mineral showings and few outcrops on the property.

In 1980 and 1981 the streams were prospected, the few outcrops mapped and a VLF-EM survey completed (Campbell and Campbell, 1981). The geophysical findings are summarized in a following section.

2 GEOMORPHOLOGY

2.1 Regional

The property lies within the Quesnel Highland physiographic region. A characteristic of this region are upland areas which are remnants of a highly dissected plateau of moderate relief formed in Tertiary times. The summit of Island Mtn. is one such remnant. Pleistocene ice covered most of the high areas and consequently most summits are rounded. Valley glaciers truncated spurs and deposited materials over much of the area. The valleys that encircle Island Mtn. were accentuated, if not created, by valley glaciers and are floored with glaciofluvial deposits.

2.1 Property

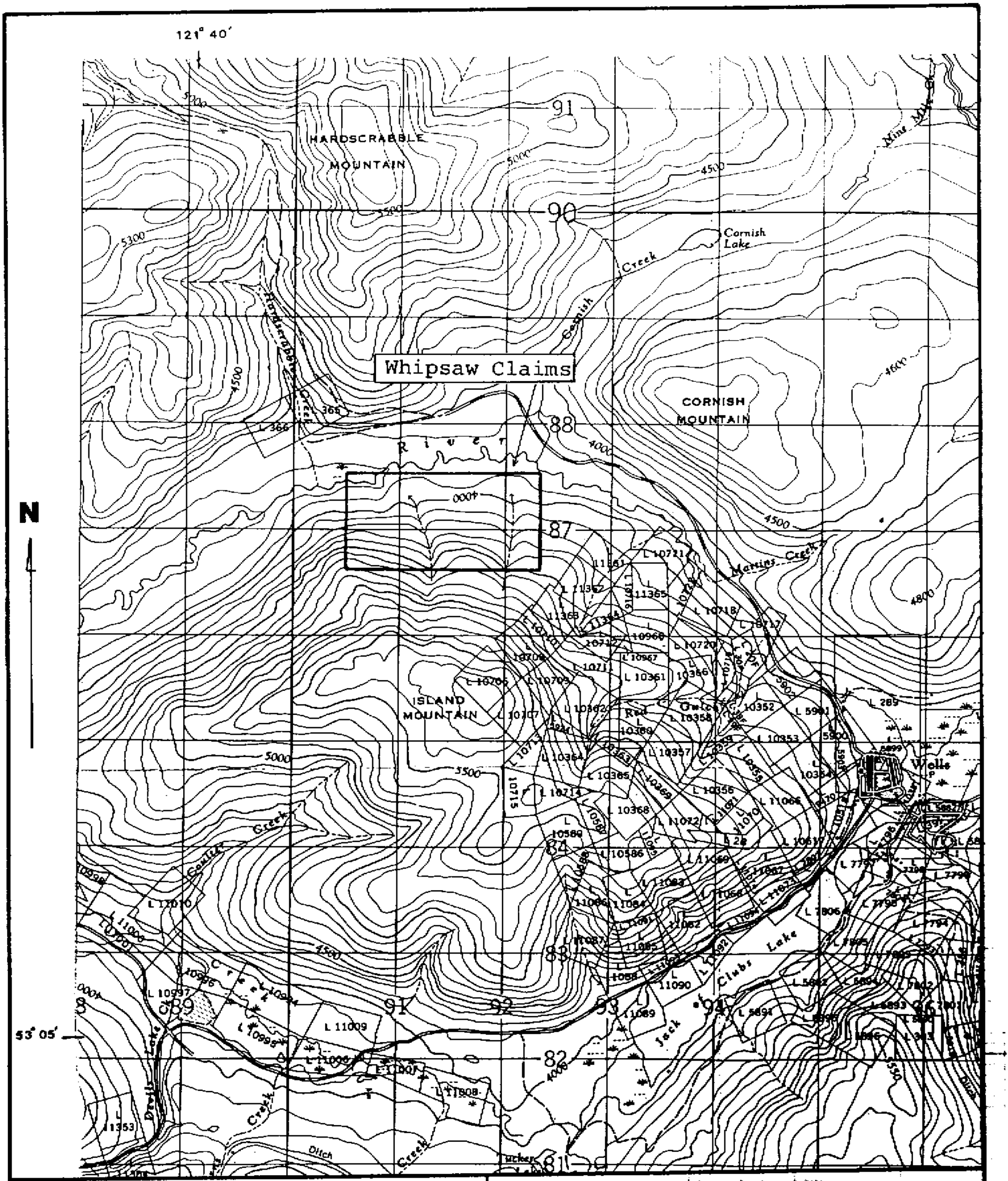
Figure 3 is a topographic map of the claims area. Relief is about 300m (1000 ft). A well developed ridge of lateral moraine lies along the north edge of the claims. On the south side of this ridge is a narrow strip of lacustrine clays and silts with a gently undulating surface. Upslope from this are outwash sand and gravels which extend to the vicinity of the location line. Compacted till and colluvium cover the upper slopes of the claims south of the location line. Coarse angular talus of amphibolite and greenstone occur in the southwest corner of the property.

The claims are thickly timbered with spruce and balsam and there are numerous thickets of willow and alder. Only a few outcrops have been found.

3 GEOLOGY

3.1 Regional

Figure 4 is the most recent interpretation of the regional geology, from Struik, 1981c. Table 1 is the explanation of symbols on this map.

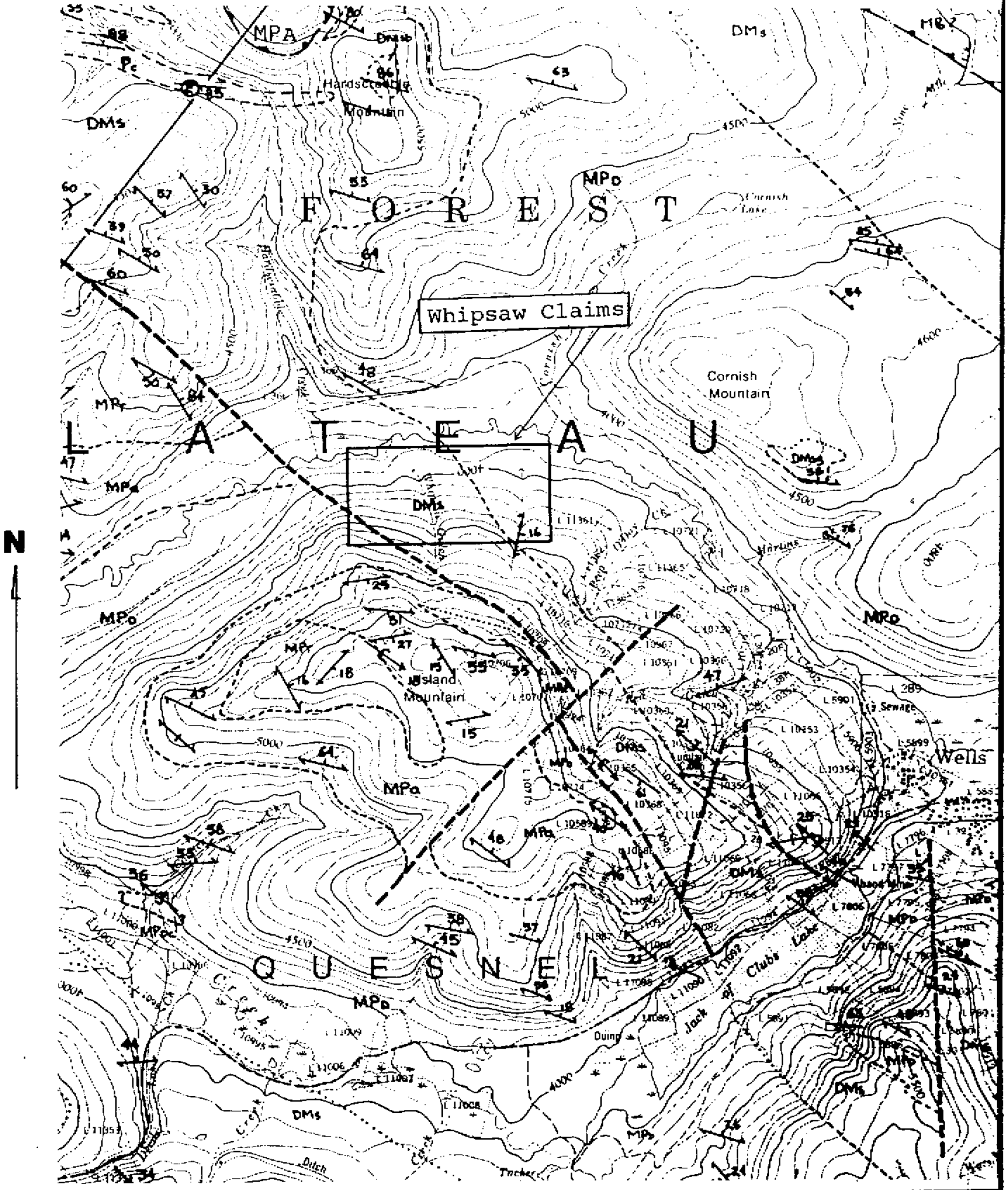


WHIPSAW CLAIMS

Cariboo Mining Division, B.C.

TOPOGRAPHIC MAP

Scale 1:50,000 0 1 km	8/20/82	93H/4E
	FIGURE 3	



From G.S.C. Open File 858
by L.C. Struik, 1981
Refer to Table 1 for legend.

Scale 1:50,000

0 1 km

8/20/82

93H/4E

FIGURE 4

WHIPSAW CLAIMS

Cariboo Mining Division, B.C.

REGIONAL GEOLOGY

Table 1. Explanation to accompany Figure 4, Regional Geology, by L.C. Struik, 1981(c).

MISSISSIPPIAN?, PENNSYLVANIAN AND PERMIAN	
MPA	Antler Formation: diorite, basalt, serpentinite, gabbro, diabase
MIDDLE PENNSYLVANIAN	
Pc	black micritic limestone, gray and black shale
MISSISSIPPIAN ? TO PERMIAN ?	
MPT	Tom Creek Succession: olive gray micaceous quartzite, phyllite and schist
MPD	Downey Creek Succession: olive and gray micaceous quartzite and phyllite, gray olive and green slate, limestone, marble, metatuff ?; MPDC limestone, marble, metatuff ?, slate
MPa	amphibolite
DEVONIAN ? AND MISSISSIPPIAN ?	
DMs	black siltite and phyllite, gray micaceous quartzite, limestone, minor metatuff ?
DMsb	graywacke, muddy conglomerate
DMsg	quartzite clast conglomerate, quartzite

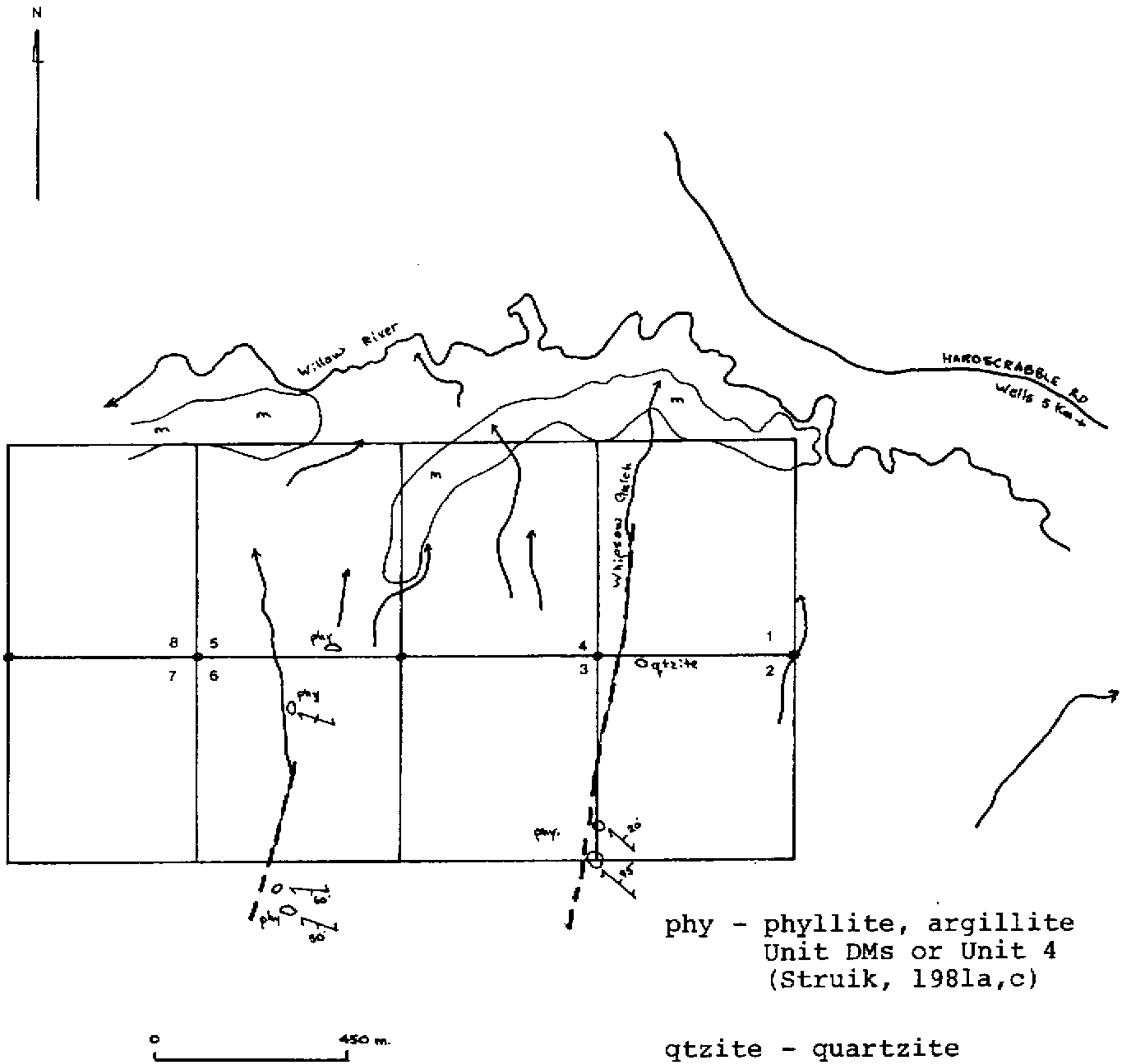
The area lies along the western part of the Omineca Tectonic Belt. Two regional tectonostratigraphic sequences are represented in Figure 4. These are (1) Upper Ordovician to Permian limestone, shale, conglomerate and sandstone represented by units Pc, MPt, MPd, and DMs in Figure 4, and (2) Permian and Pennsylvanian oceanic chert and mafic and ultramafic volcanic and intrusive rocks, unit MPA in Figure 4. The latter sequence, the Antler Formation, has been thrust from the west over the basinal sequence.

Unit DMs, previously referred by Struik (1981a) as Unit 4, is that mapped by Sutherland Brown (1957) as the Midas Formation and known at the Island Mtn. and Mosquito Creek mines as the Rainbow Member. Unit MPd, equivalent to Unit 5 of Struik (1981a), was mapped by Sutherland Brown as the Snowshoe Formation.

In the lower part of unit MPd, above the contact with unit DMs, is a limestone unit known at the gold mines as the Baker Member. More that 95% of the gold production has come from a band less than 1.5 m (5 ft) in width along the contact between the Rainbow and Baker members (Benedict, 1945). The replacement deposits found in this band are pencil-shaped bodies with an average cross-sectional area not much greater than 9 m^2 (100 ft^2). The ore bodies consist almost entirely of fine-grained pyrite with a minor amount of arsenopyrite (Sutherland Brown, 1957).

3.2 Property

Figure 5 shows the location of the few outcrops found on the claims. One broken outcrop of unit MPd, equivalent to Unit 5 of Struik (1981a) occurs near the location line of Whipsaw 1 and 2. The rock is light brownish gray micaceous quartzite with abundant rusty spots, thinly laminated and well foliated. The remainder of the outcrops found are of unit DMs, equivalent to Unit 4 of Struik (1981a) and the Rainbow Member of earlier workers. These rocks are black phyllites and argillites, thinly laminated to thinly bedded, sooty in places and locally very rusty weathering. They dip at moderate to steep angles northeast and southwest. There are at least two cleavages present in addition to the penetrative bedding plane foliation. The rocks have been tightly folded and overturned as well as being extremely sheared. The two prominent lineaments are interpreted to be developed along fractures.



phy - phyllite, argillite
Unit DMs or Unit 4
(Struik, 1981a,c)

qtzite - quartzite
Unit MPd or Unit 5
(Struik, 1981a,c)

⟝ foliation

m lateral moraine

- - - - air photo lineament

Location of outcrops on Whipsaw Claims.	WHIPSAW CLAIMS Cariboo Mining Division, B.C.		
	Scale 1:15,500	93H/4E	Sept.6/81
		FIGURE 5	

4 GEOPHYSICS

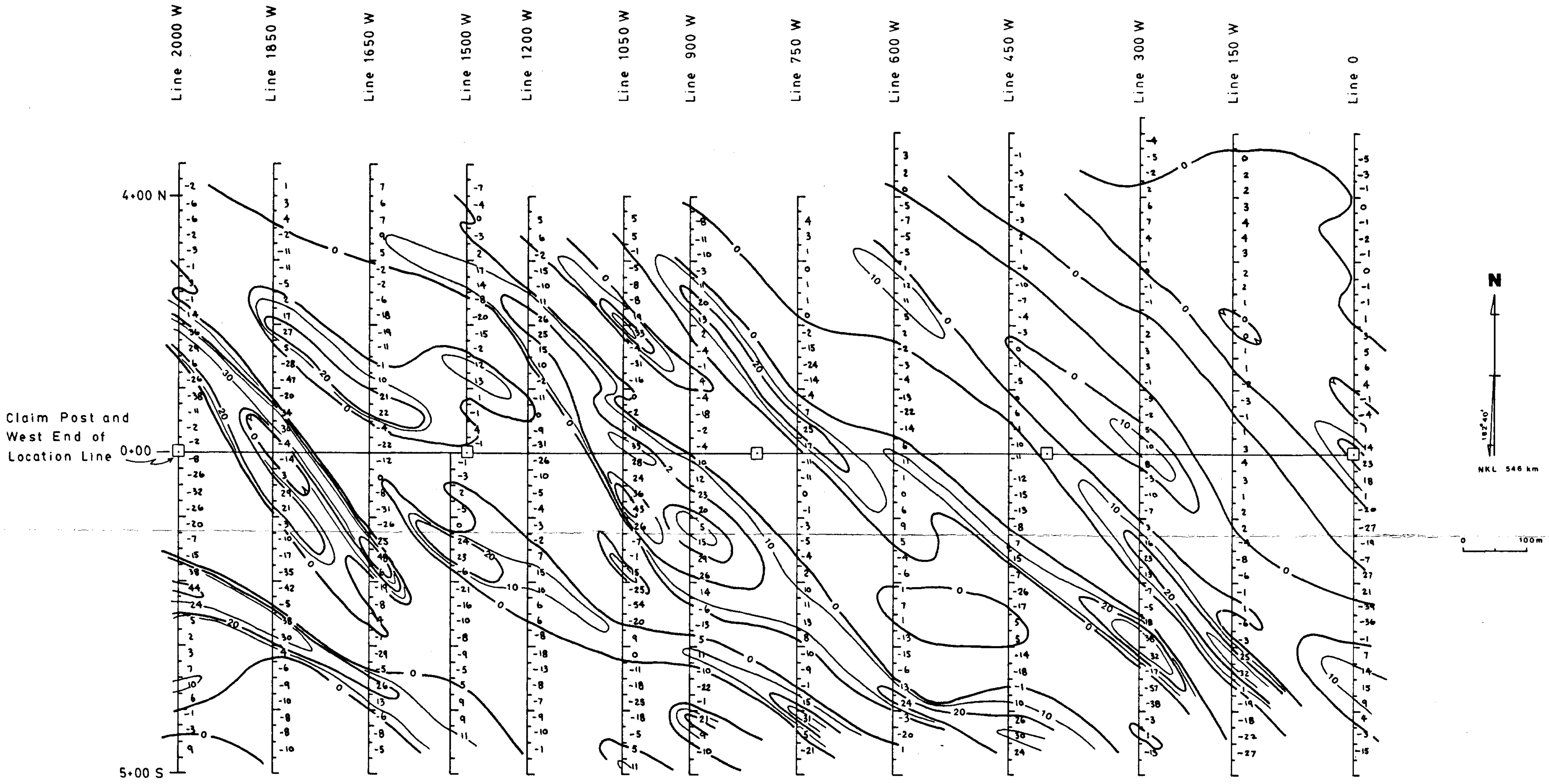
4.1 VLF-EM Survey

The geophysical assessment report of Campbell and Campbell (1981) presented the results of a reconnaissance VLF-EM survey performed in 1981. Figure 6 is a Fraser Filter contour map of the Whipsaw property. The conductor pattern indicates the northwest striking trends of the underlying structure. The region of relatively high conductivity is interpreted to be underlain by black phyllites and argillites of Unit DMs. The region of relatively low conductivity in the northeast part of the claims is thought to be underlain by micaceous quartzites of Unit MPd. This interpretation and the inferred approximate position of the contact between the rock units agrees well with the position of the known outcrops on the claims. The contact location, inferred from the geophysical work, is shown on Figure 8, a compilation and interpretative map.

5 GEOCHEMISTRY

5.1 Introduction

Ten man-days were spent in the collection of 223 soil samples. Samples were collected and analysed at two different times; September, 1981 and June 1982. Figure 7 shows the two areas sampled during these periods. The grid lines were spaced at nominal 150 m intervals and the sample stations were spaced every 50 m. This is a very coarse sampling pattern considering the relatively small size of the ore targets, but it was considered that the sampling program, of a reconnaissance nature, could delineate an area of exploration interest when the results were correlated with the geophysical work. Specifically, the objectives of the geochemical work were (1) to test for any verification of the inferred contact between the two units of concern, and (2) to examine for any



VLF Survey conducted with Geonics EM-16
via Seattle NKL, 18.6 kHz.

VLF data filtered using standard Fraser Filter;
$F_{23}=(\theta_1+\theta_2)-(\theta_3+\theta_4)$

Contour interval = 10 %

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
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WHIPSAW CLAIMS ①

Cariboo Mining Division, B.C.

VLF-EM FRASER FILTER CONTOUR MAP

Scale 1:5000 | N.T.S. 93H/4E | Sept. 6/81 | FIG. 6

anomalous arsenic values near the contact area.

A sole element was analysed for economic reasons. Arsenic was selected because arsenopyrite is known to be a common occurrence in the pyritic replacement ore bodies in the area. In addition, arsenic makes a reliable indicator element for gold because of the marked coherence between gold and arsenic during both hypogene and supergene processes (Boyle, R.W., The Geochemistry of Gold and its Deposits, G.S.C. Bulletin 280, 1979).

5.2 Sampling Method

Figure 7 is a geochemical sample location map of the Whipsaw property. Conventional sampling practices were followed. Samples were collected in 3½ x 6" Kraft paper bags and their sites marked by flags. Soil sampling was preceeded by digging pits to ½ m in depth to verify the local soil profile. The BF horizon was preferentially sampled if it was present. As only the minus 80 fraction was analysed coarse gravel and rock fragments were removed before bagging. Samples were air dried before sending to the laboratory.

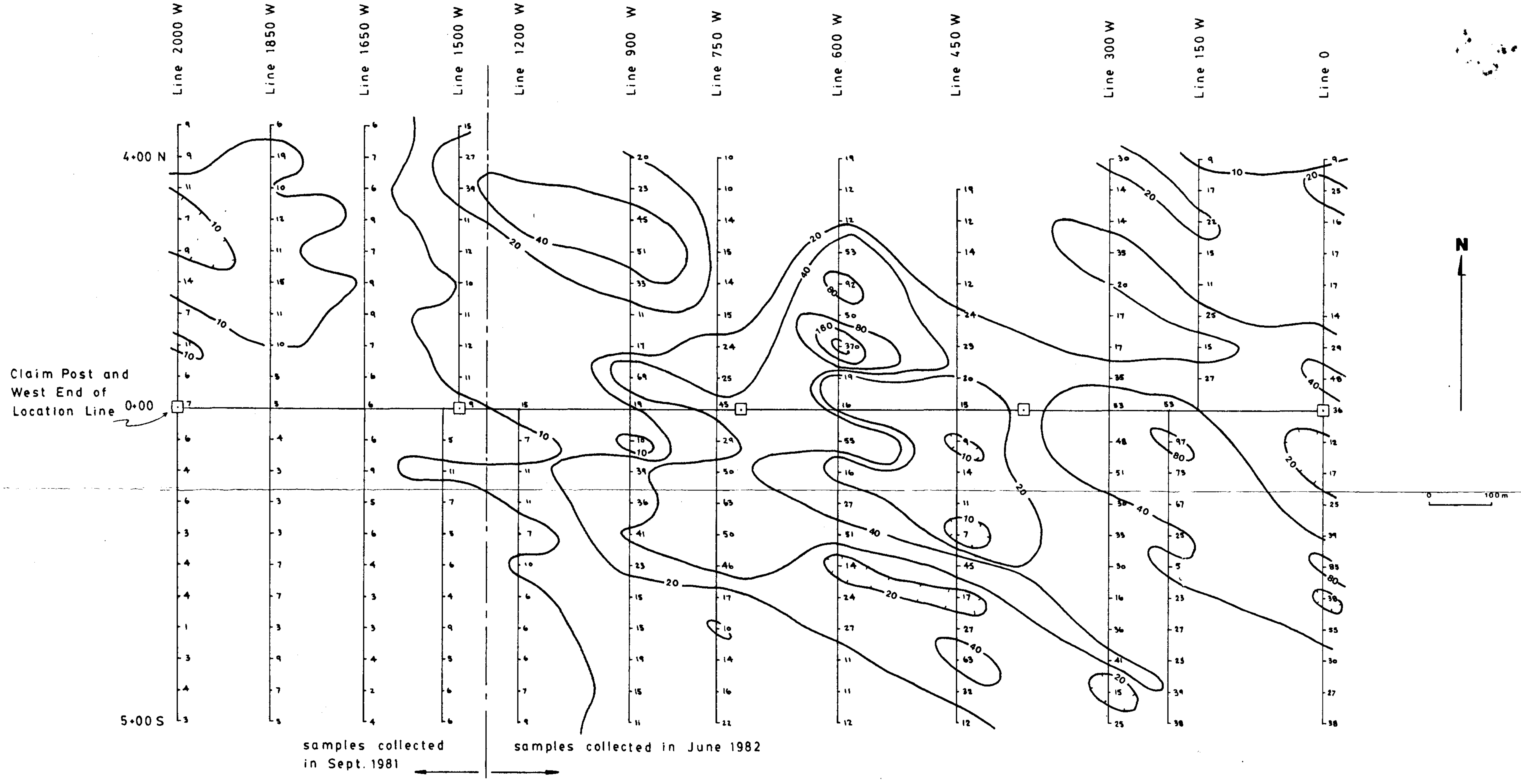
Observations were recorded on field data cards, an example of which is shown in Appendix I. Appendix I also lists the soil samples and particulars on the sample sites.

5.3 Analytical Procedure

The samples were analysed by Chemex Labs Ltd., 212 Brooksbank Ave., North Vancouver, B.C. Conventional procedures, described in Appendix II, were followed on the minus 80 fraction.

5.4 Overburden Origin and Soil Profile

There are five major subdivisions of parent material over the claims area. These are, from north to south; (1) a well developed lateral moraine of boulder gravel on the south side of Willow River (Figure 5), (2) a narrow strip of even



Contours at 10, 20, 40, 80, 160, 320 ppm Arsenic

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
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WHIPSAW CLAIMS ②

Cariboo Mining Division, B.C.

SOIL GEOCHEMISTRY
Contoured Arsenic Values

Scale 1:5000	N.T.S. 93 H/4E	Aug. 19/82	FIG. 7

textured silts and clays on the flat-lying area south of the moraine suggesting that there were times of relatively quiet water deposition related to backwaters of the ancestral Willow River or to glacial lakes in the valley, (3) moderately well sorted outwash sands and gravels which in general lie north of the location line and above the gentle topography of the fine sediments, (4) locally derived till, and (5) coarse angular talus of greenstone and amphibolite (Unit MPa) in the southwest corner of the map area.

It is estimated that the overburden thickness is 2-3 m in depth. This is based on observations of similar slopes to the southeast where road-cuts and trenches have exposed the bedrock.

Soil profiles are moderately well developed. The organic mat is generally 5-10 cm thick and underlain by a BF horizon 10-20 cm thick and a BM horizon of approximately the same thickness. In many places the BF horizon is not present and the BM horizon is the only distinct B horizon. The C horizon is encountered at depths of 30-50 cm.

5.5 Results

Figure 7 shows the analytical results for arsenic (ppm) in the soils sampled. Appendix III contains a histogram of the data set and Table 2 summarizes the geochemical statistics.

Table 2. Summary of Geochemical Statistics; Arsenic in Soil

No. Samples	Range	Mean	Standard Deviation	Statistical Threshold (1)
223	1-370	19.9	17.4	54.8

Note:- all values in ppm
- sample with 370 ppm As deleted from calculations
- (1) Mean + (2 standard deviations)

Isograds at 10, 20, 40, 80, 160, and 320 ppm As are shown in Figure 7. Soils with arsenic greater than the mean, 20 ppm, occupy the central part of the sampling grid. Their distribution shows a crude northwest-southeast elongation. There are four sites with more than 80 ppm As. These also have a northwest-southeast alignment across the central part of the claims. There is a relatively large area of low arsenic soil content (less than 10 ppm) in the southwest corner of the claims.

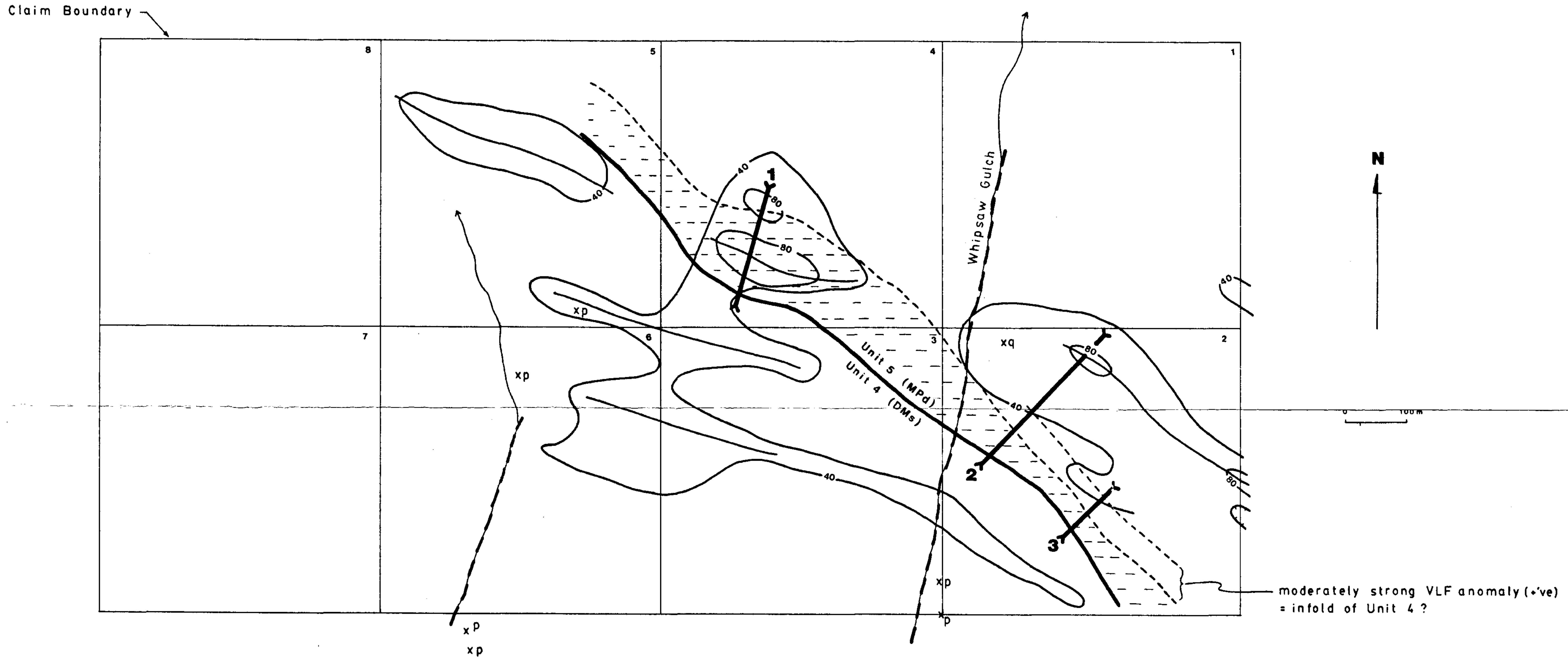
5.6 Discussion and Conclusions

The geochemical soil sampling on the Whipsaw claims indicates that there are soils with anomalous values of arsenic distributed across the central part of the claims and approximating the regional strike with a northwest trend. Figure 8 summarizes the location of soils with arsenic greater than 40 ppm (twice the mean) and 80 ppm. The general trend of the isograd axes is also shown.

The geochemical results give encouraging and supporting evidence for mineralization in conjunction with the geophysical interpretation. The geological contact between the black argillite and phyllite unit (Unit DMs or Unit 4) and the micaceous quartzite unit (Unit MPd or Unit 5) that was inferred from the VLF-Em survey is shown in Figure 8. The maximum arsenic values, specifically the four sites with arsenic more than 80 ppm, lie on the northeast side of this inferred contact. Recalling that the Baker Limestone Member, the host rock for pyritic replacement deposits which are intimately associated with arsenopyrite, is found within the micaceous quartzite unit near its contact with the argillite unit it is concluded that the arsenic anomalies are favorably situated.

6 RECOMMENDATIONS

It is recommended that trenches to bedrock be made along three alignments that intersect the inferred geological



x Outcrop

q Unit 5 micaceous quartzite (Unit MPd)

p Unit 4 phyllite, argillite (Unit DMs)

— — — Air photo lineament and possible fracture

Isograd, 40 and 80 ppm As

Arsenic anomaly axis

Units 4,5 contact interpreted from VLF survey

Prominent -'ve VLF-EM anomaly

Proposed trench alignment

MINERAL RESOURCES BRANCH
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WHIPSAW CLAIMS ③

Cariboo Mining Division, B.C.

INTERPRETATION OF SOIL GEOCHEMISTRY
AND VLF-EM SURVEY

Scale 1:5000 | N.T.S. 93H/4E | Aug. 19/82 | FIG. 8

contact in the neighbourhood of the arsenic anomalies. The proposed trench alignments are shown in Figure 8. Geological mapping and sampling of the bedrock in the proposed trenches is recommended.

8 ITEMIZED COST STATEMENT

The following expenses were incurred during the course of a geochemical soil survey, the completion of a VLF-EM16R survey and preparation of geochemical report on the Whipsaw Mineral Claims, 93H/4E, B.C., September 2nd, 1981 to August 15th, 1982.

a) Wages paid; as per attached Schedule A	$ 1,175.00
b) Analyses	
Preparation of 223 soil samples @ $0.60	133.80
Arsenic analysis of 223 samples @ $3.25	724.75
c) VLF-EM16R rental, 1 week, September 1-8, 1981 @ $140/wk	140.00
d) Data compilation, computer processing, drafting, reprographics	900.00
e) Report preparation	300.00
f) Expendible field supplies	59.00
Total Cost	$ 3,432.55

I make this solemn declaration conscientiously believing it to be true and knowing it is of the same force and effect as if made under oath and by virtue of the Canada Evidence Act.

August 15th, 1982

K. Vincent Campbell

K. Vincent Campbell (Ph.D.)
(Geologist)

ITEMIZED COST STATEMENT - SCHEDULE A - Work Schedule for Whipsaw Claims

Employee	Dates on Site	Total Days	Rate ($/day)	Total Wages ($)
J. Boutwell 2770 Windermere Cumberland, B.C.	Sept. 2, 5 1981 June 13,14,15,22 1982	6	2 @ 125 4 @ 100	250 400
M. Kozak Box 98 Wells, B.C.	Sept. 2 1981	1	125	125
K.V. Campbell Box 66 Wells, B.C.	Sept. 2,5 1981 June 14,22	4	100	400
		11 days		$ 1,175

7 CERTIFICATE

I, KENNETH VINCENT CAMPBELL, resident of Wells, Province of British Columbia, hereby certify as follows:

1. I am a Consulting Geologist with an office at the corner of Dawson and Blair Avenues, Wells, B.C.
2. I graduated with a degree of Bachelor of Science, Honours Geology, from the University of British Columbia in 1966, a degree of Master of Science, Geology, from the University of Washington in 1969, and a degree of Doctor of Philosophy, Geology, from the University of Washington in 1971.
3. I have practiced my profession for 11 years. I have been a member of the Geological Association of Canada since 1969.
4. This report is based on my field work and supervision and my examination of available reports.

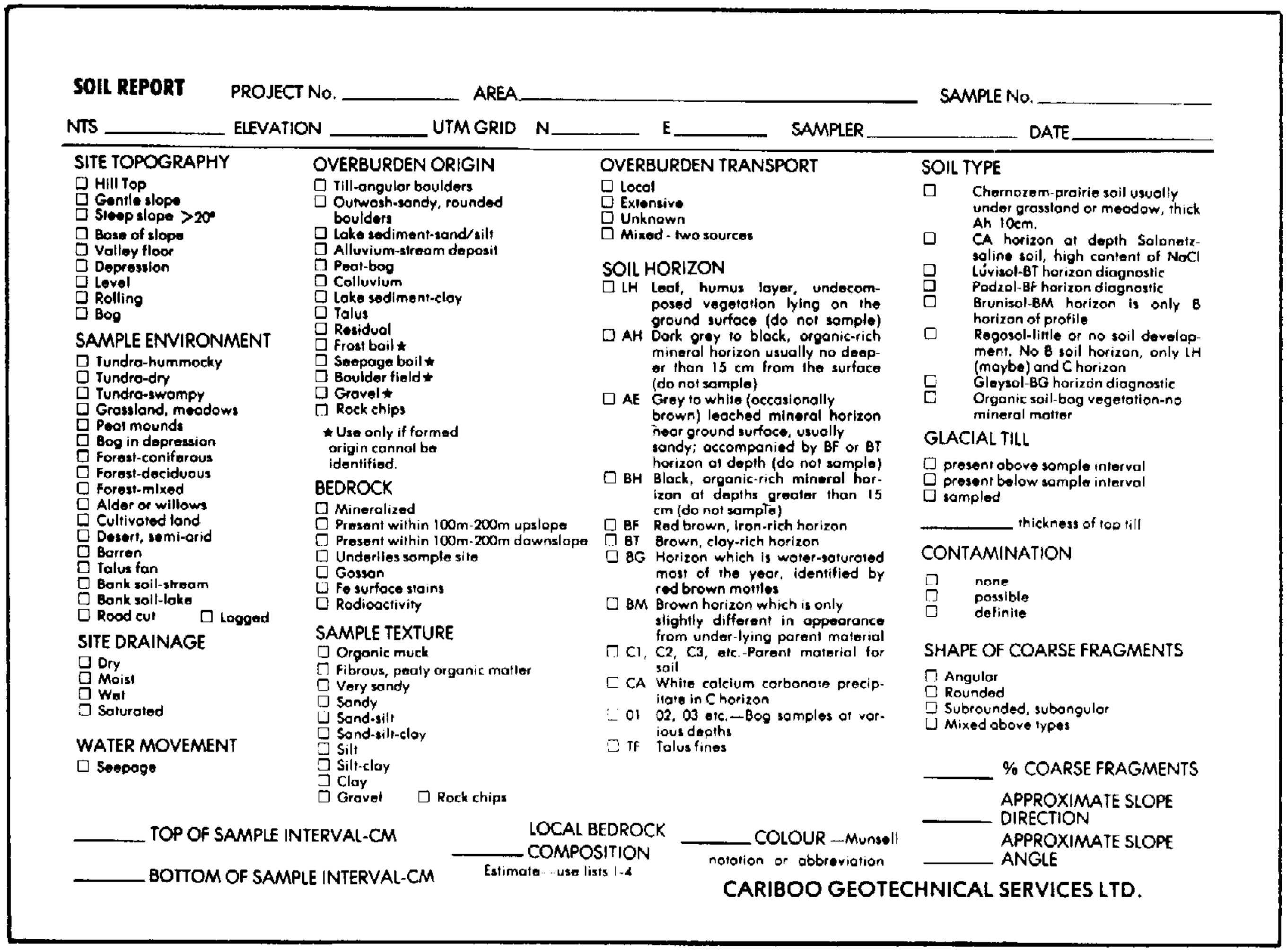
DATED at Wells, Province of British Columbia
this 4th day of September, 1982.

K. Vincent Campbell

K. Vincent Campbell, Ph.D.
Geologist

APPENDIX I

Sample Information



SOIL REPORT PROJECT No. ____________ AREA______________________________ SAMPLE No. ______________

NTS ____________ ELEVATION __________ UTM GRID N__________ E__________ SAMPLER ________________ DATE ______________

SITE TOPOGRAPHY

- ☐ Hill Top
- ☐ Gentle slope
- ☐ Steep slope >20°
- ☐ Base of slope
- ☐ Valley floor
- ☐ Depression
- ☐ Level
- ☐ Rolling
- ☐ Bog

SAMPLE ENVIRONMENT

- ☐ Tundra-hummocky
- ☐ Tundra-dry
- ☐ Tundra-swampy
- ☐ Grassland, meadows
- ☐ Peat mounds
- ☐ Bog in depression
- ☐ Forest-coniferous
- ☐ Forest-deciduous
- ☐ Forest-mixed
- ☐ Alder or willows
- ☐ Cultivated land
- ☐ Desert, semi-arid
- ☐ Barren
- ☐ Talus fan
- ☐ Bank soil-stream
- ☐ Bank soil-lake
- ☐ Road cut ☐ Logged

SITE DRAINAGE

- ☐ Dry
- ☐ Moist
- ☐ Wet
- ☐ Saturated

WATER MOVEMENT

- ☐ Seepage

OVERBURDEN ORIGIN

- ☐ Till-angular boulders
- ☐ Outwash-sandy, rounded boulders
- ☐ Lake sediment-sand/silt
- ☐ Alluvium-stream deposit
- ☐ Peat-bog
- ☐ Colluvium
- ☐ Lake sediment-clay
- ☐ Talus
- ☐ Residual
- ☐ Frost boil ★
- ☐ Seepage boil ★
- ☐ Boulder field ★
- ☐ Gravel ★
- ☐ Rock chips

★ Use only if formed origin cannal be identified.

BEDROCK

- ☐ Mineralized
- ☐ Present within 100m-200m upslope
- ☐ Present within 100m-200m downslope
- ☐ Underlies sample site
- ☐ Gossan
- ☐ Fe surface stains
- ☐ Radioactivity

SAMPLE TEXTURE

- ☐ Organic muck
- ☐ Fibrous, pealy organic matter
- ☐ Very sandy
- ☐ Sandy
- ☐ Sand-silt
- ☐ Sand-silt-clay
- ☐ Silt
- ☐ Silt-clay
- ☐ Clay
- ☐ Gravel ☐ Rock chips

OVERBURDEN TRANSPORT

- ☐ Local
- ☐ Extensive
- ☐ Unknown
- ☐ Mixed - two sources

SOIL HORIZON

- ☐ LH Leaf, humus layer, undecomposed vegetation lying on the ground surface (do not sample)
- ☐ AH Dark grey to black, organic-rich mineral horizon usually no deeper than 15 cm from the surface (do not sample)
- ☐ AE Grey to white (occasionally brown) leached mineral horizon near ground surface, usually sandy; accompanied by BF or BT horizon at depth (do not sample)
- ☐ BH Black, organic-rich mineral horizon at depths greater than 15 cm (do not sample)
- ☐ BF Red brown, iron-rich horizon
- ☐ BT Brown, clay-rich horizon
- ☐ BG Horizon which is water-saturated most of the year, identified by red brown mottles
- ☐ BM Brown horizon which is only slightly different in appearance from under-lying parent material
- ☐ C1, C2, C3, etc.-Parent material for soil
- ☐ CA White calcium carbonate precipitate in C horizon
- ☐ 01 02, 03 etc.—Bog samples at various depths
- ☐ TF Talus fines

SOIL TYPE

- ☐ Chernozem-prairie soil usually under grassland or meadow, thick Ah 10cm.
- ☐ CA horizon at depth Solonetz-saline soil, high content of NaCl
- ☐ Luvisol-BT horizon diagnostic
- ☐ Podzol-BF horizon diagnostic
- ☐ Brunisol-BM horizon is only B horizon of profile
- ☐ Regosol-little or no soil development. No B soil horizon, only LH (maybe) and C horizon
- ☐ Gleysol-BG horizon diagnostic
- ☐ Organic soil-bag vegetation-no mineral matter

GLACIAL TILL

- ☐ present above sample interval
- ☐ present below sample interval
- ☐ sampled

____________ thickness of top till

CONTAMINATION

- ☐ none
- ☐ possible
- ☐ definite

SHAPE OF COARSE FRAGMENTS

- ☐ Angular
- ☐ Rounded
- ☐ Subrounded, subangular
- ☐ Mixed above types

________ % COARSE FRAGMENTS

________ APPROXIMATE SLOPE DIRECTION

________ APPROXIMATE SLOPE ANGLE

________ TOP OF SAMPLE INTERVAL-CM

________ BOTTOM OF SAMPLE INTERVAL-CM

________ LOCAL BEDROCK COMPOSITION
Estimate—use lists 1-4

________ COLOUR —Munsell notation or abbreviation

CARIBOO GEOTECHNICAL SERVICES LTD.

Sample Field Data Card

WHIPSAW CLAIMS SOIL SAMPLE INFORMATION

Sample #	Site Topography	Overburden Origin	Soil Horizon	Sample Interval
0000W 500S	LEVEL	TILL	BM	20-25
0000W 450S	GENTLE SLOPE	ALLUVIUM	BM	20-25
0000W 400S	GENTLE SLOPE	ALLUVIUM	BM	20-25
0000W 350S	GENTLE SLOPE	TILL	BM	20-25
0000W 300S	GENTLE SLOPE	TILL	BF	20-25
0000W 250S	GENTLE SLOPE	TILL	BF	20-25
0000W 200S	STEEP SLOPE	TILL	BF	25-30
0000W 150S	GENTLE SLOPE	TILL	BM	20-25
0000W 100S	STEEP SLOPE	TILL	BM	15-20
0000W 050S	GENTLE SLOPE	TILL	BF	20-25
0000W 000	GENTLE SLOPE	TILL	BM	15-20
0000W 050N	GENTLE SLOPE	TILL	BM	20-25
0000W 100N	GENTLE SLOPE	FINE SEDIMENT	BM	20-25
0000W 150N	GENTLE SLOPE	TILL	BF	15-20
0000W 200N	GENTLE SLOPE	TILL	BF	15-20
0000W 250N	GENTLE SLOPE	ALLUVIUM	BF	15-20
0000W 300N	GENTLE SLOPE	FINE SEDIMENT	BG	20-25
0000W 350N	ROLLING	ALLUVIUM	BM	15-20
0000W 400N	LEVEL	FINE SEDIMENT	BF	25-30
0150W 500S	GENTLE SLOPE	TILL	BF	25-30
0150W 450S	GENTLE SLOPE	TILL	BM	20-25
0150W 400S	GENTLE SLOPE	TILL	BF	25-30
0150W 350S	GENTLE SLOPE	TILL	BM	20-25
0150W 300S	STEEP SLOPE	TILL	BF	15-20
0150W 250S	GENTLE SLOPE	TILL	BF	25-30
0150W 200S	STEEP SLOPE	TILL	BF	25-30
0150W 150S	GENTLE SLOPE	TILL	BF	15-20
0150W 100S	GENTLE SLOPE	TILL	BM	20-25
0150W 050S	GENTLE SLOPE	TILL	BM	20-25
0150W 000	GENTLE SLOPE	ALLUVIUM	BM	15-20
0150W 050N	GENTLE SLOPE	ALLUVIUM	BM	20-25
0150W 100N	GENTLE SLOPE	ALLUVIUM	BM	20-25
0150W 150N	GENTLE SLOPE	TILL	BM	20-25
0150W 200N	GENTLE SLOPE	ALLUVIUM	BF	25-30
0150W 250N	GENTLE SLOPE	ALLUVIUM	BF	25-30
0150W 300N	GENTLE SLOPE	OUTWASH	BM	15-20
0150W 350N	GENTLE SLOPE	ALLUVIUM	BF	20-25
0150W 400N	LEVEL	FINE SEDIMENT	BF	20-25
0300W 500S	STEEP SLOPE	TILL	BF	20-25
0300W 450S	GENTLE SLOPE	TILL	BM	20-25
0300W 400S	STEEP SLOPE	TILL	BM	15-20
0300W 350S	STEEP SLOPE	TILL	BM	25-30
0300W 300S	STEEP SLOPE	TILL	BM	20-25
0300W 250S	GENTLE SLOPE	FINE SEDIMENT	BT	20-25
0300W 200S	GENTLE SLOPE	COLLUVIUM	BM	20-25
0300W 150S	STEEP SLOPE	COLLUVIUM	BM	20-25
0300W 100S	STEEP SLOPE	TILL	BM	20-25
0300W 050S	STEEP SLOPE	TILL	BM	20-25
0300W 000	STEEP SLOPE	TILL	BF	25-30
0300W 050N	STEEP SLOPE	TILL	BF	15-20

Sample #	Site Topography	Overburden Origin	Soil Horizon	Sample Interval
0300W 100N	STEEP SLOPE	FINE SEDIMENT	BM	15-20
0300W 150N	STEEP SLOPE	ALLUVIUM	BF	15-20
0300W 200N	GENTLE SLOPE	ALLUVIUM	BF	20-25
0300W 250N	LEVEL	OUTWASH	BF	15-20
0300W 300N	GENTLE SLOPE	ALLUVIUM	BF	15-20
0300W 350N	GENTLE SLOPE	FINE SEDIMENT	BF	20-25
0300W 400N	ROLLING	ALLUVIUM	BF	20-25
0450W 500S	GENTLE SLOPE	TILL	BM	20-25
0450W 450S	STEEP SLOPE	TILL	BM	15-20
0450W 400S	STEEP SLOPE	TILL	BM	15-20
0450W 350S	STEEP SLOPE	TILL	BF	25-30
0450W 300S	STEEP SLOPE	TILL	BM	25-30
0450W 250S	STEEP SLOPE	TILL	BM	15-20
0450W 200S	STEEP SLOPE	COLLUVIUM	BH (?)	20-25
0450W 150S	STEEP SLOPE	TILL	BF	15-20
0450W 100S	STEEP SLOPE	TILL	BF	20-25
0450W 050S	STEEP SLOPE	TILL	BM	15-20
0450W 000	HILL TOP	TILL	BF	15-20
0450W 050N	HILL TOP	TILL	BF	15-20
0450W 100N	GENTLE SLOPE	TILL	BF	20-25
0450W 150N	HILL TOP	TILL	BF	20-25
0450W 200N	GENTLE SLOPE	TILL	BF	15-20
0450W 250N	GENTLE SLOPE	ALLUVIUM	BF	20-25
0450W 300N	GENTLE SLOPE	ALLUVIUM	BF	20-25
0450W 350N	GENTLE SLOPE	ALLUVIUM	BF	15-20
0600W 500S	GENTLE SLOPE	TILL	BM	20-25
0600W 450S	GENTLE SLOPE	COLLUVIUM	BH	20-25
0600W 400S	GENTLE SLOPE	TALUS	BM	10-20
0600W 350S	GENTLE SLOPE	COLLUVIUM	BM	15-20
0600W 300S	GENTLE SLOPE	TALUS	BM	15-20
0600W 250S	STEEP SLOPE	TILL	BM	15-20
0600W 200S	STEEP SLOPE	TILL	BM	15-20
0600W 150S	STEEP SLOPE	TILL	BM	20-25
0600W 100S	STEEP SLOPE	TILL	BM	20-25
0600W 050S	GENTLE SLOPE	TILL	BM	20-25
0600W 000	HILL TOP	TILL	BF	15-20
0600W 050N	STEEP SLOPE	TILL	BF	20-25
0600W 100N	STEEP SLOPE	TILL	BM	20-25
0600W 150N	STEEP SLOPE	TILL	BM	20-25
0600W 200N	STEEP SLOPE	TILL	BM	20-25
0600W 250N	GENTLE SLOPE	FINE SEDIMENT	BM	10-15
0600W 300N	GENTLE SLOPE	OUTWASH	BF	20-25
0600W 350N	GENTLE SLOPE	ALLUVIUM	BF	10-15
0600W 400N	GENTLE SLOPE	ALLUVIUM	BF	15-20
0750W 500S	STEEP SLOPE	ALLUVIUM	BM	20-25
0750W 450S	STEEP SLOPE	FINE SEDIMENT	BF	15-20
0750W 400S	GENTLE SLOPE	TILL	BF	20-25
0750W 350S	STEEP SLOPE	FINE SEDIMENT	BM	15-20
0750W 300S	GENTLE SLOPE	TILL	BM	20-25
0750W 250S	GENTLE SLOPE	TILL	BM	15-20

Sample #	Site Topography	Overburden Origin	Soil Horizon	Sample Interval
0750W 200S	GENTLE SLOPE	TILL	BM	20-25
0750W 150S	GENTLE SLOPE	TILL	BM	20-25
0750W 100S	STEEP SLOPE	TILL	BM	30-35
0750W 050S	STEEP SLOPE	TILL	C	35-40
0750W 000	LEVEL	TILL	BM	25-30
0750W 050N	STEEP SLOPE	TILL	BF	15-20
0750W 100N	STEEP SLOPE	TILL	BM	20-25
0750W 150N	GENTLE SLOPE	TILL	BF	15-20
0750W 200N	STEEP SLOPE	TILL	BF	15-20
0750W 250N	STEEP SLOPE	TILL	BF	15-20
0750W 300N	STEEP SLOPE	TILL	BF	15-20
0750W 350N	STEEP SLOPE	TILL	BF	20-25
0750W 400N	STEEP SLOPE	TILL	BF	15-20
0900W 500S	STEEP SLOPE	TILL	BM	15-20
0900W 450S	STEEP SLOPE	TILL	BM	18-22
0900W 400S	STEEP SLOPE	TILL	BF	15-20
0900W 350S	GENTLE SLOPE	TILL	BF	15-20
0900W 300S	STEEP SLOPE	TILL	BM	20-25
0900W 250S	STEEP SLOPE	TILL	BF	25-30
0900W 200S	STEEP SLOPE	COLLUVIUM	BM	30-40
0900W 150S	STEEP SLOPE	TILL	BM	25-30
0900W 100S	GENTLE SLOPE	TILL	BM	20-25
0900W 050S	GENTLE SLOPE	ALLUVIUM	BF	15-20
0900W 000	STEEP SLOPE	TILL	BM	30-35
0900W 050N	STEEP SLOPE	TILL	BM	20-25
0900W 100N	STEEP SLOPE	TILL	BF	15-20
0900W 150N	STEEP SLOPE	TILL	BF	15-20
0900W 200N	STEEP SLOPE	ALLUVIUM	BF	30-35
0900W 250N	STEEP SLOPE	ALLUVIUM	BM	15-20
0900W 300N	GENTLE SLOPE	TILL	BG	20-25
0900W 350N	STEEP SLOPE	TILL	BM	20-25
0900W 400N	STEEP SLOPE	TILL	BM	20-25
1200W 500S	STEEP SLOPE	COLLUVIUM	BF	30-40
1200W 450S	STEEP SLOPE	TALUS	BF	40-50
1200W 400S	STEEP SLOPE	COLLUVIUM	BF	30-40
1200W 350S	STEEP SLOPE	TALUS	BF	30-40
1200W 300S	STEEP SLOPE	COLLUVIUM	BM	25-35
1200W 250S	STEEP SLOPE	COLLUVIUM	BF	30-40
1200W 200S	STEEP SLOPE	COLLUVIUM	BF	30-40
1200W 150S	STEEP SLOPE	COLLUVIUM	BF	20-30
1200W 100S	GENTLE SLOPE	COLLUVIUM	BF	15-25
1200W 050S	STEEP SLOPE	COLLUVIUM	BF	10-20
1200W 000	BASE OF SLOPE	COLLUVIUM	BM	20-35
1500W 500S	STEEP SLOPE	TALUS	BF	20-30
1500W 450S	STEEP SLOPE	COLLUVIUM	BM	20-30
1500W 400S	STEEP SLOPE	COLLUVIUM	BF	35-45
1500W 350S	STEEP SLOPE	TILL	BF	15-25
1500W 300S	BASE OF SLOPE	COLLUVIUM	BM	40-50
1500W 250S	STEEP SLOPE	COLLUVIUM	BM	30-40
1500W 200S	STEEP SLOPE	TILL	BM	20-30

Sample #	Site Topography	Overburden Origin	Soil Horizon	Sample Interval
1500W 150S	GENTLE SLOPE	COLLUVIUM	BM	30-40
1500W 100S	GENTLE SLOPE	COLLUVIUM	BF	30-40
1500W 050S	STEEP SLOPE	TILL	BM	25-35
1500W 000	BASE OF SLOPE	TILL	BF	30-40
1500W 050N	ROLLING	OUTWASH (?)	BF	20-30
1500W 100N	GENTLE SLOPE	OUTWASH (?)	BF	20-30
1500W 150N	GENTLE SLOPE	OUTWASH (?)	BF	25-35
1500W 200N	GENTLE SLOPE	OUTWASH (?)	BF	25-35
1500W 250N	GENTLE SLOPE	OUTWASH	BF	25-35
1500W 300N	GENTLE SLOPE	OUTWASH	BF	25-35
1500W 350N	ROLLING	OUTWASH	BF	25-35
1500W 400N	GENTLE SLOPE	TILL	BF	20-30
1500W 450N	ROLLING	FINE SEDIMENT	BF	20-30
1650W 500S	STEEP SLOPE	TALUS	BF	20-30
1650W 450S	STEEP SLOPE	TALUS	BM	30-40
1650W 400S	STEEP SLOPE	TALUS	BM	40-50
1650W 350S	STEEP SLOPE	TILL	BF	30-40
1650W 300S	STEEP SLOPE	TILL	BF	20-30
1650W 250S	STEEP SLOPE	TILL	BF	30-40
1650W 200S	STEEP SLOPE	TILL	BF	15-25
1650W 150S	STEEP SLOPE	TILL	BF	15-20
1650W 100S	STEEP SLOPE	TILL	BF	15-20
1650W 050S	STEEP SLOPE	TILL	BF	20-30
1650W 000	STEEP SLOPE	COLLUVIUM	BF	20-30
1650W 050N	LEVEL	ALLUVIUM	BM	30-40
1650W 100N	GENTLE SLOPE	COLLUVIUM	BF	20-30
1650W 150N	STEEP SLOPE	COLLUVIUM	BM	20-30
1650W 200N	STEEP SLOPE	TILL	BF	25-35
1650W 250N	STEEP SLOPE	OUTWASH	BF	15-20
1650W 300N	GENTLE SLOPE	ALLUVIUM	BM	25-35
1650W 350N	GENTLE SLOPE	OUTWASH (?)	BF	20-30
1650W 400N	GENTLE SLOPE	FINE SEDIMENT	BF	20-30
1650W 450N	GENTLE SLOPE	FINE SEDIMENT	BF	20-30
1850W 500S	GENTLE SLOPE	COLLUVIUM	BF	15-20
1850W 450S	GENTLE SLOPE	TILL	BF	15-20
1850W 400S	GENTLE SLOPE	TILL	BF	15-20
1850W 350S	GENTLE SLOPE	TILL	BF	10-15
1850W 300S	STEEP SLOPE	TILL	BM	20-25
1850W 250S	STEEP SLOPE	TILL	BM	15-20
1850W 200S	GENTLE SLOPE	TILL	BF	15-20
1850W 150S	GENTLE SLOPE	TILL	BM	10-15
1850W 100S	GENTLE SLOPE	TILL	BF	15-20
1850W 050S	GENTLE SLOPE	TILL	BF	20-25
1850W 000	GENTLE SLOPE	COLLUVIUM	BF	10-15
1850W 050N	GENTLE SLOPE	TILL	BF	20-25
1850W 100N	STEEP SLOPE	OUTWASH	BF	25-30
1850W 150N	STEEP SLOPE	OUTWASH	BF	20-30
1850W 200N	STEEP SLOPE	OUTWASH	BF	30-40
1850W 250N	STEEP SLOPE	OUTWASH	BF	30-40
1850W 300N	GENTLE SLOPE	OUTWASH	BF	20-30

Sample #	Site Topography	Overburden Origin	Soil Horizon	Sample Interval
1850W 350N	GENTLE SLOPE	OUTWASH	BF	20-30
1850W 400N	GENTLE SLOPE	FINE SEDIMENT	BF	15-25
1850W 450N	ROLLING	FINE SEDIMENT	BF	15-20
2000W 500S	GENTLE SLOPE	COLLUVIUM	BF	15-20
2000W 450S	GENTLE SLOPE	COLLUVIUM	BF	10-15
2000W 400S	GENTLE SLOPE	COLLUVIUM	BF	10-15
2000W 350S	STEEP SLOPE	COLLUVIUM	BF	5-10
2000W 300S	STEEP SLOPE	TILL	BF	5-10
2000W 250S	GENTLE SLOPE	TILL	BF	5-10
2000W 200S	GENTLE SLOPE	TILL	BF	5-10
2000W 150S	STEEP SLOPE	TILL	BF	5-10
2000W 100S	GENTLE SLOPE	TILL	BF	5-10
2000W 050S	GENTLE SLOPE	TILL	BF	20-25
2000W 000	GENTLE SLOPE	TILL	BF	20-25
2000W 050N	STEEP SLOPE	TILL	BF	30-40
2000W 100N	STEEP SLOPE	TILL	BF	15-30
2000W 150N	HILL TOP	TILL	BF	15-20
2000W 200N	STEEP SLOPE	OUTWASH	BF	25-30
2000W 250N	STEEP SLOPE	OUTWASH	BF	25-30
2000W 300N	GENTLE SLOPE	OUTWASH	BF	20-30
2000W 350N	GENTLE SLOPE	FINE SEDIMENT	BF	20-30
2000W 400N	GENTLE SLOPE	FINE SEDIMENT	BF	12-15
2000W 450N	LEVEL	FINE SEDIMENT	BF	15-20

APPENDIX II

Analytical Procedures

Geochemical Preparation and Analytical Procedure

Arsenic

The geochemical soil samples are dried at 80 C for a period of 12 to 14 hours. The dried sample is sieved to -80 mesh fraction through a nylon and stainless steel sieve.

A 1.0 gram sample is digested with a mixture of perchloric and nitric acid to strong fumes of perchloric acid. The digested solution is diluted to volume and mixed. An aliquot of the digest is acidified, reduced with Kl and mixed. A portion of the reduced solution is converted to arsine with $NaBH_4$ and the arsenic content determined using flameless atomic absorption.

The detection limit using a Techtron A.A. 5 atomic absorption unit is 1 ppm. A correction is made for background absorption.

APPENDIX III

Histogram of Sample Analyses

WHIPSAW CLAIMS - Soil Samples

Histogram of 222 Arsenic analyses

Mean = 19.9 ppm
Standard Deviation = 17.4 ppm
Range of analyses = 1 - 97 ppm

Note: One sample with 370 ppm As deleted from calculations and not shown on graph below.